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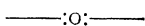
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ornaments them, and if the fictile art has originated with her, and has grown up under her hands, it seems no less probable that the ornaments she uses should have originated with her, and the probability is increased by the fact that to her falls the work of spinning and weaving, of making and decorating personal ornaments and clothes, and of making baskets, mats, etc. She is everywhere the primitive decorative artist, and to-day it is the exception that man occupies himself with ornamental art, even in civilized countries. Woman covers with ornament everything her hand touches, and the lady in her boudoir industriously embroiders, on some article of mere luxury, the same series of frets and scroll borders that, on the Amazonas, the savage unclothed squaw as diligently and with as firm a hand, traces with a spine on the damp surface of the clay vessel she is fashioning. It is as if they both sang the same simple song. The ornaments in both cases are identical and not only of wholly independent origin, but it may be also of very different age. Those of the savage are the mere embryonic beginnings of art-life, while those of the boudoir, like the *Lingula* of to-day, are archaic forms, persistent through the ages, still flourishing unchanged among the varied wealth of derivatives by evolution from the ancient primary forms.



SEEDS OF THE VIOLET AND OTHER PLANTS AS PROJECTILES.

BY MOSES N. ELROD, M.D.

THE capsules of the cleistogenous flowers of *Viola cucullata*, *V. canadensis* and *V. striata*, by a peculiar mechanical movement of the valves project their seeds from a few inches to four or five feet. As *V. cucullata* is a very common plant, with numerous seed pods in the latter part of the season, it has been most carefully studied, and will be the first described. When the seeds are ripe, the pod that before had been folded back on its crooked procumbent stem, becomes erect, opens into three valves that place themselves at right angles with the straightened and erected peduncle, and, as it were, look directly upwards. By straightening the peduncle, the seed vessels that heretofore had been concealed, are brought on a level with or above the leaves. Each one of the carinate valves contains from three to four rows of

seeds, attached by short funiculi to a common parietal placenta. The seeds of the inner rows being attached to the top, while the outer ones are attached to the sides of the raised keel, give to the boat-shaped valves an appearance of overloading, and are heaped up in the middle, and were it not for their slender funiculi would be spilled out by the least motion. The shooting process is now begun by the hard smooth edges and sides of the valves pressing on the outer rows of seeds below their greatest diameter; the pressure being transmitted to the under side of the seeds of the heaped up middle rows, they generally are the first projected. Usually but one seed is projected at a time, and the short funiculi permitting another one to take the vacant space, the inner rows are kept full until but a single row remains. But the movement does not stop here; it is continued, and the pressure reinforced by the outer, and sometimes the inner end of the valve coming into close contact and clasping the seed on three sides, until all are forced out, one by one, and the sides of the valve are left in contact. During the process of drying, which still continues in the now empty and useless valve, the sides are separated and it again assumes the former carinate shape. Any one seeing the dry and empty pods would scarcely think of their having gone through the changes we have described. And as the movements that project the seeds take place while the valves of the capsule are yet in a semi-green state we conclude they form an important part in the life history of the plant. The pods of the inconspicuous flowers of *V. striata*, are grown in the axils of the leafy stem, on long peduncles, and have the same movements of straightening and erection as in *V. cucullata*. The pods of *Viola canadensis* are sessile.

The projecting movement may be roughly compared to the unloading of a boat by slowly crushing the sides together.

The shooting process may be conveniently watched by gathering the mature pods after they have opened, and plunging the stem into a cup of sand; however, treated thus the valves after once closing will not again re-open. The lateness in the season at which my observations began, prevented my seeing the pods following the conspicuous flowers.

In giving the generic characters of *Pilea* in his Manual of Botany, Prof. Gray says, "Fertile flowers. Sepals three, oblong, more or less unequal; a rudiment of a stamen before each in the

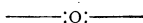
form of a hooded scale. Achenium ovate, compressed, straight and erect, partly or nearly naked."

In *P. pumila* the distal end of the elastic hooded scales are held down by the otherwise naked seed. The rudimentary stamens may be compared to a V-shaped spring, the ends of which are pressed together. When the seed is ripe and its connection with the receptacle broken, the hooded scales suddenly, partially straightens and the seed shot into the air five feet or more. The arrow-head shape of the achenium, and the arrangement of the cymes on long axillary stems shortened from below upwards, are favorable to the great range of the flying projectile. The mechanism of the movement is sufficiently simple, but the special adaptation of an essential organ of a perfect flower to a new use is very peculiar.

Prof. Gray says of *Oxalis*: "Pod membranaceous, deeply five lobed, five celled, each cell opening on the back. Seeds few in each cell, pendulous from the axis, their outer coat loose and separating." The loose outer coat of the seed of *Oxalis stricta* bursts on the edge opposite its attachment to the axis, and is suddenly rolled back, breaking the funiculus, and at the same time separating the walls of the cell and projecting the seed two or three feet. By this movement the loose coat is generally turned inside out. The flattened oval seeds are marked on their sides by transverse striæ that doubtless give direction to the elastic coat when it bursts. Before the seeds are fully matured they may be removed from the cell and the coating caused to burst by touching them with some sharp-pointed instrument. So quick is the movement that one is strongly reminded by it of a jumping flea. No other species than *Oxalis stricta* was observed.

That the movements of the seeds described are important, if not essential to the life of the plant, seems evident. The ripening capsules of the violet may be found until late in autumn, we have seen them after snowfall, and without some such movement as has been mentioned, would go on seeding the same ground the season through, and year after year. The same remark is true of the wood sorrell, the membranaceous pod of which would otherwise fall to the ground near the root of the plant carrying its crop of seeds with it. The general resemblance in habit and appearance of balsam and richweed would lead us to expect some special provision for scattering their seeds in the one as the other.

It may be further noticed that while the movements described are each different and peculiar to a single genus of plants, they are unlike those of the well-known balsam, and those of the witch-hazel as given by Mr. Meehan a few years since.



INSTINCT AND REASON.

BY F. C. CLARK, M.D.

IF the great array of startling facts, presented in the works of Mr. Darwin, be not wholly convincing, they at least clearly demonstrate a somewhat closer connection of man with lower organizations than has hitherto been acknowledged. Since the invention of the microscope and its application to the natural sciences, the study of natural phenomena has opened a field of inquiry never before dreamed of by the most imaginative theorist. Myriads of infinitesimal forms of life, which formerly escaped detection, have thus been revealed, and though many a one lacks that complexity of organization which usually attracts our notice, yet even in their simplicity they present a problem as intricate and perplexing as the most highly organized being. These minute organisms often seem but mere centers of life (points of attraction), around which cluster other existences still more minute and but just perceptible to the highest powers of the microscope. Organization appears, many times, hardly more than nominal. Even to-day their nature defies solution, so as to render it impossible to assign them any satisfactory place in the scale of being; and after the new discoveries daily added, the naturalist is at a loss to find the dividing line between the various forms of life expressed by the old names of "animal" and "vegetable."

The division of the living world into the "vegetable" and "animal" is at best but arbitrary. It is not enough to take well characterized types of each division and compare them with each other. Such differences would be self evident. But, instead, it is needful to give such a definition of each division as will cover every variety, however diverse, which is included in that division to which the definition has been given. Thus, much confusion in classification is avoided; though, unfortunately for us, the problem remains unsolved; for the new facts daily brought to light render necessary continual changes in classification, and